

What is claimed is:

1 1. A method of incrementally rendering content in a content framework, comprising steps of:
2 receiving a request for a portal page, wherein one or more portlets provide content for the
3 portal page;
4 immediately returning a response message containing a first document, the first document
5 representing results from portlets which have acquired their content; and
6 programmatically generating a mechanism for delivering an updated document if the first
7 document does not represent results of all portlets.

1 2. The method according to Claim 1, wherein the programmatically generated mechanism
2 comprises inclusion of a refresh trigger in the response message.

1 3. The method according to Claim 2, wherein the refresh trigger is a refresh header of the
2 response message.

1 4. The method according to Claim 2, wherein the refresh trigger is encoded using syntax of a
2 markup language.

1 5. The method according to Claim 4, wherein the markup language is HTML ("Hypertext
2 Markup Language").

1 6. The method according to Claim 5, wherein the syntax comprises a "META" tag using an

2 “HTTP-EQUIV” attribute syntax.

1 7. The method according to Claim 4, wherein the markup language is WML (“Wireless
2 Markup Language”).

1 8. The method according to Claim 4, wherein the markup language is i-mode format.

1 9. The method according to Claim 4, wherein the markup language is HDML (“Handheld
2 Device Markup Language”).

1 10. The method according to Claim 2, wherein a value on the refresh trigger specifies a time
2 before which the programmatically generated mechanism does not execute.

1 11. The method according to Claim 2, wherein a value on the refresh trigger is computed as a
2 time after which a sender of the portal page request automatically invokes the delivery of the
3 updated document.

1 12. The method according to Claim 2, wherein a value on the refresh trigger is computed as a
2 latest predicted completion time of a final one of the portlets which have not yet acquired their
3 content.

1 13. The method according to Claim 12, wherein the value is determined by weighting actual

2 fetch times of the portlets which have not yet acquired their content.

1 14. The method according to Claim 12, wherein the value is determined by adding a constant
2 value to a largest of weighted actual fetch times of the portlets which have not yet acquired their
3 content.

1 15. The method according to Claim 2, further comprising steps of:
2 receiving the response message by a client from which the request for the portal page was
3 sent;
4 rendering, by the client, the first document from the received response message; and
5 automatically sending a subsequent request for the portal page after waiting for a time
6 specified by a value of the refresh trigger.

1 16. The method according to Claim 2, further comprising steps of:
2 receiving a subsequent request for the portal page, the subsequent request having been
3 automatically sent responsive to receiving the refresh trigger; and
4 returning a subsequent response comprising the updated document, responsive to
5 receiving the subsequent request, the updated document being a subsequent version of the first
6 document and representing results from portlets which have acquired their content thus far and
7 which omits the refresh trigger only if all portlets have now acquired their content.

1 17. The method according to Claim 1, wherein the programmatically generated mechanism

2 comprises creating a multipart document, and wherein the first document is embedded in a first of
3 the parts of the multipart document.

1 18. The method according to Claim 17, wherein the first of the parts is preceded by a
2 boundary string used to delimit parts of the multipart document.

1 19. The method according to Claim 18, wherein the first of the parts is followed by a
2 terminating boundary string if the first document represents results from all portlets.

1 20. The method according to Claim 17, further comprising steps of:
2 receiving the response message by a client from which the request for the portal page was
3 sent;
4 rendering, by the client, the first document from the first of the parts of the multipart
5 document;
6 receiving, by the client, subsequent parts of the multipart document, each of the
7 subsequent parts comprising a revised version of the first document; and
8 rendering, by the client, the subsequent parts of the multipart document.

1 21. The method according to Claim 17, further comprising steps of:
2 detecting that one or more of the portlets which had not acquired their content when the
3 first document was returned in the response message have now acquired their content; and
4 sending, responsive to the detecting step, a subsequent response message containing a

5 revised version of the first document, the revised version representing results from the one or
6 more portlets and being embedded in a subsequent part of the multipart document.

1 22. The method according to Claim 21, wherein the subsequent part is preceded by a
2 boundary string used to delimit parts of the multipart document and is followed by a terminating
3 boundary string if the revised version represents results from all portlets.

1 23. The method according to Claim 1, wherein the programmatically generated mechanism
2 comprises programmatically inserting a hyperlink into the first document, wherein the inserted
3 hyperlink can be used to explicitly request delivery of the updated document.

1 24. A method of incrementally rendering content in a content framework, comprising steps of:
2 receiving a request for a portal page, wherein one or more portlets provide content for the
3 portal page;
4 immediately returning a response message containing a first document, the first document
5 representing results from portlets which have acquired their content; and
6 automatically delivering an updated document if the first document does not represent
7 results of all portlets.

1 25. A method of incrementally rendering content in a content framework, comprising steps of:
2 receiving a request for a portal page frame, wherein one or more portlets provide content
3 for the portal page frame;

4 immediately returning a response message containing a first mini-document, the first
5 document representing results from portlets which have acquired their content; and
6 programmatically generating a mechanism for delivering an updated mini-document if the
7 first mini-document does not represent results of all portlets.

1 26. The method according to Claim 25, wherein the programmatically generated mechanism
2 comprises inclusion of a refresh header in the response message.

1 27. The method according to Claim 25, wherein the programmatically generated mechanism
2 comprises inclusion of an syntax element in the response header, wherein the syntax element is
3 encoded using a markup language.

1 28. The method according to Claim 27, wherein the markup language is HTML ("Hypertext
2 Markup Language") and the syntax element comprises a "META" tag using an "HTTP-EQUIV"
3 attribute syntax.

1 29. The method according to Claim 26, wherein a value on the refresh header is computed as
2 a time after which a sender of the portal page frame request automatically invokes the delivery of
3 the updated mini-document.

1 30. The method according to Claim 25, wherein the programmatically generated mechanism
2 comprises creating a multipart document, and wherein the first mini-document is embedded in a

3 first of the parts of the multipart document.

1 31. The method according to Claim 30, wherein the first of the parts is preceded by a
2 boundary string used to delimit parts of the multipart document, and is followed by a terminating
3 boundary string if the first mini-document represents results from all portlets.

1 32. A system for incrementally rendering content in a content framework, comprising:
2 means for receiving a request for a portal page, wherein one or more portlets provide
3 content for the portal page;
4 means for immediately returning a response message containing a first document, the first
5 document representing results from portlets which have acquired their content; and
6 means for programmatically generating a mechanism for delivering an updated document
7 if the first document does not represent results of all portlets.

1 33. The system according to Claim 32, wherein the programmatically generated mechanism
2 comprises inclusion of a refresh trigger in the response message.

1 34. The system according to Claim 32, further comprising:
2 means for receiving the response message by a client from which the request for the portal
3 page was sent;
4 means for rendering, by the client, the first document from the received response message;
5 and

6 means for automatically sending a subsequent request for the portal page after waiting for
7 a time specified by a value of the refresh trigger.

1 35. The system according to Claim 32, further comprising:

2 means for receiving a subsequent request for the portal page, the subsequent request
3 having been automatically sent responsive to receiving the refresh trigger; and

4 means for returning a subsequent response comprising the updated document, responsive
5 to receiving the subsequent request, the updated document being a subsequent version of the first
6 document and representing results from portlets which have acquired their content thus far and
7 which omits the refresh trigger only if all portlets have now acquired their content.

1 36. The system according to Claim 32, wherein the programmatically generated mechanism
2 comprises creating a multipart document, and wherein the first document is embedded in a first of
3 the parts of the multipart document.

1 37. The system according to Claim 36, wherein the first of the parts is preceded by a boundary
2 string used to delimit parts of the multipart document, and is followed by a terminating boundary
3 string only if the first document represents results from all portlets.

1 38. The system according to Claim 36, further comprising:

2 means for receiving the response message by a client from which the request for the portal
3 page was sent;

4 means for rendering, by the client, the first document from the first of the parts of the
5 multipart document;
6 means for receiving, by the client, subsequent parts of the multipart document, each of the
7 subsequent parts comprising a revised version of the first document; and
8 means for rendering, by the client, the subsequent parts of the multipart document.

1 39. The system according to Claim 36, further comprising:

2 means for detecting that one or more of the portlets which had not acquired their content
3 when the first document was returned in the response message have now acquired their content;
4 and

5 means for sending, responsive to the means for detecting, a subsequent response message
6 containing a revised version of the first document, the revised version representing results from
7 the one or more portlets and being embedded in a subsequent part of the multipart document.

1 40. The system according to Claim 39, wherein the subsequent part is preceded by a boundary
2 string used to delimit parts of the multipart document and is followed by a terminating boundary
3 string if the revised version represents results from all portlets.

1 41. The system according to Claim 32, wherein the programmatically generated mechanism
2 comprises programmatically inserting a hyperlink into the first document, wherein the inserted
3 hyperlink can be used to explicitly request delivery of the updated document.

1 42. A system for incrementally rendering content in a content framework, comprising:
2 means for receiving a request for a portal page frame, wherein one or more portlets
3 provide content for the portal page frame;
4 means for immediately returning a response message containing a first mini-document, the
5 first document representing results from portlets which have acquired their content; and
6 means for programmatically generating a mechanism for delivering an updated mini-
7 document if the first mini-document does not represent results of all portlets.

1 43. The system according to Claim 42, wherein the programmatically generated mechanism
2 comprises inclusion of a refresh header in the response message.

1 44. The method according to Claim 42, wherein the programmatically generated mechanism
2 comprises inclusion of an syntax element in the response header, wherein the syntax element is
3 encoded using a markup language.

1 45. The system according to Claim 42, wherein the programmatically generated mechanism
2 comprises creating a multipart document, and wherein the first mini-document is embedded in a
3 first of the parts of the multipart document.

1 46. A computer program product incrementally rendering content in a content framework, the
2 computer program product embodied on one or more computer-usable media and comprising:
3 computer readable program code means for receiving a request for a portal page, wherein

4 one or more portlets provide content for the portal page;
5 computer readable program code means for immediately returning a response message
6 containing a first document, the first document representing results from portlets which have
7 acquired their content; and
8 computer readable program code means for programmatically generating a mechanism for
9 delivering an updated document if the first document does not represent results of all portlets.

1 47. The computer program product according to Claim 46, wherein the programmatically
2 generated mechanism comprises inclusion of a refresh trigger in the response message.

1 48. The computer program product according to Claim 46, further comprising:
2 computer readable program code means for receiving the response message by a client
3 from which the request for the portal page was sent;
4 computer readable program code means for rendering, by the client, the first document
5 from the received response message; and
6 computer readable program code means for automatically sending a subsequent request
7 for the portal page after waiting for a time specified by a value of the refresh trigger.

1 49. The computer program product according to Claim 46, further comprising:
2 computer readable program code means for receiving a subsequent request for the portal
3 page, the subsequent request having been automatically sent responsive to receiving the refresh
4 trigger; and

5 computer readable program code means for returning a subsequent response comprising
6 the updated document, responsive to receiving the subsequent request, the updated document
7 being a subsequent version of the first document and representing results from portlets which
8 have acquired their content thus far and which omits the refresh trigger only if all portlets have
9 now acquired their content.

1 50. The computer program product according to Claim 46, wherein:
2 the programmatically generated mechanism comprises creating a multipart document;
3 the first document is embedded in a first of the parts of the multipart document;
4 the first of the parts is preceded by a boundary string used to delimit parts of the multipart
5 document; and
6 the first of the parts is followed by a terminating boundary string only if the first document
7 represents results from all portlets.

1 51. The computer program product according to Claim 50, further comprising:
2 computer readable program code means for receiving the response message by a client
3 from which the request for the portal page was sent;
4 computer readable program code means for rendering, by the client, the first document
5 from the first of the parts of the multipart document;
6 computer readable program code means for receiving, by the client, subsequent parts of
7 the multipart document, each of the subsequent parts comprising a revised version of the first
8 document; and

9 computer readable program code means for rendering, by the client, the subsequent parts
10 of the multipart document.

1 52. The computer program product according to Claim 50, further comprising:

2 computer readable program code means for detecting that one or more of the portlets
3 which had not acquired their content when the first document was returned in the response
4 message have now acquired their content; and

5 computer readable program code means for sending, responsive to the computer readable
6 program code means for detecting, a subsequent response message containing a revised version of
7 the first document, the revised version representing results from the one or more portlets and
8 being embedded in a subsequent part of the multipart document.

1 53. The computer program product according to Claim 52, wherein the subsequent part is
2 preceded by a boundary string used to delimit parts of the multipart document and is followed by
3 a terminating boundary string only if the revised version represents results from all portlets.